

*St Bartholomew's Hospital
With The Author's Copy*

ON

A REMARKABLE EFFECT

OF

CROSS-BREEDING.

BY

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IF the fact which forms the subject of this Essay have the character of a law of nature, it must obviously admit of important practical applications. To the physiologist, the physician, and even the lawyer, it may occasionally be of value in questions relative to personal identity and legitimacy, the origin of constitutional diseases, and the interpretation of vital phenomena. But it is to the agriculturist that it must needs be chiefly important. With him it cannot fail often to enter as an element into his estimate of the purity of an animal's breed, and to form an object of special regard in the breeding of stock.

The fact, however, has heretofore been but little attended to, and still less understood. Long familiar, indeed, with one or two of the examples given of it in the following pages, I once regarded them as solitary instances of an unimportant and inexplicable phenomenon; and, in delivering lectures on physiology, was accustomed either to pass them over in silence, or to content myself with a passing allusion to them. But my attention was particularly directed to the subject in 1849, by a paper published in the "Aberdeen Journal" newspaper (for March 21st and 28th of that year), by an intelligent veterinary surgeon, Mr. James M'Gillavray, of Huntly. In that paper, Mr. M'Gillavray brought together a tolerably large collection of analogous cases, and offered an original, and, what seemed to me, an ingenious and satisfactory explanation of them.

My interest in the subject being thus engaged, and conceiving that the fact involved in it might be a more general one than I had hitherto imagined, I pursued it for myself; and, taking a somewhat

wider field of inquiry than was done by Mr. M-Gillavray, I published the result of my researches in two separate papers in the volumes of the Edinburgh "Monthly Journal of Medical Science" for 1849 and 1850.

Encouraged by the notice which these papers have attracted in various quarters, and by the desire expressed by several influential individuals that I would continue my inquiries, I am induced to venture on the present publication. That something effectual may be done towards a more perfect understanding of the subject, it seems desirable to make more widely known what is already ascertained regarding it, and, particularly, to bring it fairly under the notice of the agricultural body—to whom, indeed, we must mainly look for its farther elucidation. It is with this view that these pages are submitted to the public. And I would fain hope that the Directors of the several Agricultural Societies of the United Kingdom may be led to take up the subject and encourage its investigation. How much they have it in their power to do this, and how much the prosecution of it would be in keeping with the ends for which those Societies were instituted, it is unnecessary to say.

It need only farther be observed, that I have here endeavoured to exhibit the subject in a form as little technical, and as little speculative as possible; and that, with this view, I have avoided introducing various discussions and collateral points of inquiry which I thought it right to enter upon in the pages of the Monthly Journal.

ABERDEEN, *January*, 1851.

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THERE is a circumstance connected with the process of breeding in the higher classes of animals, which seems to me to merit a larger share; than it has yet received, of the attention of the Agricultural body. It is this,—that a male animal, that has once had fruitful connection with a female, may so influence her future offspring begotten by *other* males, as, to a greater or less extent, to *engraft* upon them *his own distinctive features*;—his influence thus reaching to the subsequent progeny in whose conception he himself has had no share,—and his image and superscription being, so to speak, more or less legibly inscribed upon them.

Accordingly, if the female be of a *different* breed or species from that male, and have thus borne a *cross* or a *hybrid* by him, her subsequent offspring, got by males of the *same* breed or species as herself, may yet have, more or less, the characters of a cross or hybrid.

It seems not improbable, indeed, that on *every* occasion of fruitful intercourse between a male and a female, *some* effect of this kind is wrought on the breeding powers of the female; but it would appear that the *greatest* effect results from the *first* sexual connection. Whether the effect is absolutely permanent, and might shew itself in all the offspring which the female is capable of subsequently

producing, is at present uncertain; but it would seem, in some instances at least, to disappear after a time.

Of this singular phenomenon examples will presently be given. That it is not less practical in its bearing than singular in its character, must be evident to every one. If it be a *general* fact,—that is to say, a fact having the character of a *law* of nature, it is one obviously of practical application in the breeding of stock. It will at once appear how important it must be that care be taken in the selection of the male, and particularly of the first male, in the coupling of animals even of the same breed; and, if the preservation of a pure breed be an object of regard, that *crossing* be in every instance religiously eschewed. Whether it be a fact of that description, cannot, in the meantime, with any confidence be alleged. At present, the fact itself is probably known to comparatively few, and what is known regarding it is deficient both in scientific accuracy and in practical value. But the conjecture may be hazarded, that were the subject brought prominently under the notice of breeders, and were the communication of illustrative cases solicited by the Agricultural Societies of the United Kingdom, a large collection of examples, presently known only to individuals and, therefore, lost to science, might be obtained, sufficient to exhibit the *commonness* of the fact, and thus to *enhance* its importance in public estimation.

The following examples of the phenomenon, and statements respecting it, comprise what is presently known to me in regard to the *facts* of the subject.

(1.) (*a.*)—A young chesnut *Mare*, seven-eighths Arabian, belonging to the Earl of Morton, was covered in 1815 by a Quagga, which is a sort of wild ass, from Africa, and marked somewhat after the manner of the Zebra. The mare was served but once with the Quagga, and, in due time, gave birth to a *hybrid*, which had distinct marks of the Quagga in the shape of its head, black bars on the

shoulders, &c. In 1817, 1818, and 1821, the same mare was covered by a very fine black Arabian horse, and produced, successively, three foals, all of which bore unequivocal marks of the Quagga.*

(b.)—A mare belonging to Sir Gore Ouseley was covered by a *Zebra*, and gave birth to a hybrid. The year following, the same mare was served by a thorough-bred horse, and the next succeeding year by another horse. Both the foals thus produced were *striped*, that is to say, partook of the characters of the *Zebra*.†

(c.)—It was long ago stated by the illustrious Haller, and also by Becker, that when a mare has had a mule by an *Ass*, and afterwards a foal by a horse, the foal exhibits traces of the ass;‡—a statement which I find recently confirmed by Professor Low of Edinburgh, in a letter to Sir John S. Forbes of Pitsligo.

(d.)—In the foregoing cases, the mares were covered in the first instance by males of a different *species* from their own. But there are cases recorded of mares covered in every instance by horses, but by different horses on differ-

* The first and the second of these foals are thus described:—
“They have the character of the Arabian breed as decidedly as can be expected, where fifteen-sixteenths of the blood are Arabian; and they are fine specimens of that breed; but both in their colour, and in the hair of their manes, they have a striking resemblance to the Quagga. Their colour is bay, *marked more or less like the Quagga* in a darker tint. Both are distinguished by the dark line along the ridge of the back, the dark stripes across the fore-hand, and the dark bars across the back part of the legs. Both their manes are black; that of the filly is short, stiff, and stands upright; that of the colt is long, but so stiff as to arch upwards, and to hang clear of the sides of the neck; in which circumstance it resembles that of the hybrid. This is the more remarkable, as the manes of the Arabian breed hang lank, and closer to the neck than those of most others.”—(Philosophical Transactions, 1821, pp. 20, 21; Dunglison’s Human Physiology, 3d ed., vol. ii., p. 387; Mayo’s Physiology, 4th ed., p. 397.)

† M^r Gillavray, “Aberdeen Journal,” for March 28, 1849. Paintings of these animals, and their skins, are said to be preserved in the Museum of the Royal College of Surgeons of England.

‡ Haller, Element. Physiol., viii., p. 104; Becker, Physic. Subterranean., Lips, 1703.

ent occasions, where the subsequent offspring exhibited the characters of the horse by which impregnation was first effected. Of this, Mr. M'Gillavray gives two examples. Thus, in several foals, in the royal stud at Hampton Court, got by the horse *Actæon*, there were unequivocal marks of the horse *Colonel*, by which the dams of these foals were covered the previous year. Again, a colt, the property of the Earl of Suffield, got by *Laurel*, so resembled another horse, *Camel*, "that it was whispered, nay, even asserted, at New-Market, that he must have been got by Camel." It was ascertained, however, that the only relation which the colt bore to *Camel* was, that the latter had served his mother the previous season. In farther illustration of this point, I beg to adduce an interesting statement, made by Professor Low. After remarking that "sometimes there is difficulty in getting a thorough-bred mare to breed for the first time with a thorough-bred horse," and that "in this case, in order to cause her to commence breeding, a coarse stallion is put to her," Professor Low adds, "but the effect never fails to be seen in the progeny, the coarser characters of the first male re-appearing, however highly-bred the subsequent stallions may be."

(2.)—Breeders of cattle are familiar with analogous facts as occurring in the *Bovine* race. The two following cases, taken from Mr. M'Gillavray, may serve as examples:—A pure Aberdeenshire heifer, was served with a pure Teeswater bull, by which she had a first-cross calf. The following season, the same cow was served with a pure Aberdeenshire bull: the produce was a *cross* calf, which, when two years old, had very long horns, the parents being both polled. Again, a pure Aberdeenshire cow was served, in 1845, with a cross bull, that is to say, an animal produced between a first-cross cow and a pure Teeswater bull. To this bull she had a cross calf. Next season she was served with a pure Aberdeenshire bull: the produce was quite a cross in shape and colour.

(3.)—With regard to the *Dog*, it has often been observed, and, indeed, it seems to be matter of notoriety, that a well-bred bitch, if she have been impregnated by a mongrel-dog, will not, although lined subsequently by a pure dog, bear thorough-bred puppies ever after, or at least in the next two or three litters.* And it appears farther, that the progeny are affected in respect, not merely of their shape and colour, *but of their natural instinct also*.—A pure Terrier bitch (of the Skye breed), of a dark brown colour with red legs, was lined the first and the second time she came in season by one and the self-same dog—a mongrel-cur,—and produced in the first litter four and in the second three puppies, all of which took very decidedly after the cur, which was black with red legs and white feet. On the third occasion, she was lined by a pure dog (of a grey colour) of exactly the same breed as herself; and, in order that no other might have access to her, she was locked up with this dog the whole time her heat lasted. The issue was two puppies, both of which bore the closest possible resemblance to the cur in colour, shape, and appearance generally.†

(4.)—The like occurrence has been observed in respect of the *Pig*. A sow of the black-and-white breed, (known as Mr. Western's breed), belonging to Mr. Giles, became pregnant by a boar of the wild breed, of a deep chesnut colour. The pigs produced were duly mixed, the colour of the boar being in some of them very predominant. The sow being afterwards put to a boar of the same breed as her own, some of the progeny were observed to be stained, or otherwise marked, with the *chesnut* colour that prevailed in the former litter. And, on a subsequent impregnation, the boar being still of the same breed as the sow, some of the latter were also *slightly* marked with the chesnut colour. What

* See Kirkes' Handbook of Physiology, p. 613.

† Communicated to the Author by Mr. John Culbert, Student of Medicine at the University and King's College of Aberdeen.

gives additional value to this observation is, that in the course of many years' experience, the breed in question was never known to produce offspring having the smallest tinge of the chesnut colour.*

(5.)—Not the least striking examples, perhaps, of the phenomenon, are the two following observed in the *Sheep*;—the first communicated to me by my friend Dr. William Wells, of the island of Grenada—the other by Mr. William M'Combie, Tillyfour, in Aberdeenshire:—

(a.)—A small flock of ewes, belonging to Dr. Wells, were tupped a few years ago by a ram procured for that purpose from the manager of a neighbouring estate. The ewes were all of them *white* and *woolly*. The ram was of quite another breed, being (besides having other marks of difference) of a *chocolate* colour, and *hairy* like the goat. The progeny were of course crosses, bearing, however, a great resemblance to the male parent.

The next season, Dr. Wells procured another ram of precisely the same breed as the ewes. The progeny of this second connection showed distinct marks of resemblance to the former ram in *colour* and *covering*. And the like phenomenon, occurring under the like circumstances, was observed in the lambs of some other adjoining estates in Grenada, and was the occasion of equal surprise and perplexity to the owners of the animals.

(b.)—Six very superior pure-bred *black-faced horned* ewes, the property of Mr. Harry Shaw, in the parish of Leochel-Cushnie, in Aberdeenshire, were tupped in the autumn of 1844,—some of them by a Leicester, *i.e.*, a *white-faced* and *polled* ram,—others of them by a Southdown, *i.e.*, a *dun-faced* and *polled* ram. The lambs thus begotten were crosses.

In the autumn of 1845, the same ewes were tupped by a very fine pure black-faced horned ram, *i.e.*, one of exactly the same breed as the ewes themselves. To Mr. Shaw's

* Philosophical Transactions for 1821, p. 23.

astonishment, the lambs were all without exception *polled* and *brownish* in the face, instead of being black-faced and horned.

In autumn 1846, the ewes were again served with another very superior ram of their own breed. Again the lambs were mongrels. They did not, indeed, exhibit so much of the characters of the Leicester and Southdown breeds, as did the lambs of the previous year; but two of them were *polled*, and one *dun*-faced, with *very small* horns,—while the other three, were *white*-faced, with *small round horns only*. Mr Shaw at length parted with those fine ewes, without obtaining from them one pure-bred lamb.

To the foregoing examples, I may add two important general statements on the subject, made by Mr. M'Gillivray and by Professor Low. The former, after referring to several of the cases just given, adds: "*Many more instances might be cited did time permit. Among cattle and horses they are of every day occurrence;*" and the latter, after giving the particulars already quoted respecting the horse, observes, "*Many analogous examples could be given in the case of other animals.*" And I may remark, generally, that, since my attention was first particularly drawn to the subject, inquiry made in various quarters has satisfied me of the accuracy of those general allegations. I have not, it is true, seen any examples of the sort; but opportunities for doing so have not lain in my way. I have learnt, however, that many among the Agricultural body in this district are familiar with the thing to a degree that is annoying to them; finding that, after breeding crosses, their cows, though served with bulls of the same breed, yield crosses still, or rather mongrels.

Before leaving this part of the subject, reference may be made to the occurrence of the phenomenon in our own species. I have elsewhere gone more fully into this point

than I consider it necessary to do here. But I am unwilling altogether to pass it over, *first*, because some notice of it is essential to a complete general view of the subject; and, *secondly*, because some into whose hands this pamphlet may fall, may have opportunities of meeting with instances of the fact, and of thus contributing somewhat to the noble science of Human Physiology.

Now, there is, it seems, a popular belief, that, in the case of a woman twice married, and fruitful by both husbands, the children of the *second* marriage may resemble their mother's *first* husband, both in bodily structure and in mental powers.* An instance of this has been communicated to me by the Rev. Charles M'Combie of Tillyfour, as coming under his own observation in this county, and very remarkable. It is obvious, indeed, that in any case—as in the one just referred to—where all the parties are of the *same* variety of the human family, the alleged resemblance must be comparatively difficult of verification. But it is equally obvious, that means exist for subjecting the question to a pretty decisive test. There are equally distinct varieties of the human family as of any of the lower animals; and all that is requisite for bringing it to a satisfactory issue is, to observe accurately whether the children of European parents, when the mother has, in the first instance, had offspring by a Negro, exhibit traces of the latter in the colour of the skin, the quality of the hair, the form of the features, &c.; or, contrari-wise, whether the children of Negro parents, when the mother had, first of all, been impregnated by a European, manifest the peculiarities of the latter.

Of the former case, a professional friend informs me that he recollects hearing of an instance in this neighbourhood, but cannot vouch for the truth of it. Professor Simpson of Edinburgh, however, has kindly communicated to me one

* Dr. Allen Thomson, *Cyclopædia of Anatomy and Physiology*, vol. ii., p. 468.

such case, verified by himself. It is given below.* Of the latter case, examples are possibly to be met with in our West India colonies, the Brazils, and the slave-holding States of North America. Two very intelligent friends, however, (the one a West-India proprietor, the other a medical man), both long resident in Jamaica, tell me that they never observed, nor ever heard of, an instance of the kind, although connections of that sort are common there, and children born under such circumstances very numerous. It is singular, if instances of the kind in question do occur, and still more if they are of frequent occurrence, that they should not be notorious. It is conceivable, however, and by no means improbable, that cases do exist, but that they have been overlooked from the traces of the European being so slight as to escape ordinary observation, and the fact have remained unknown from special attention never having been directed to it.

Limited as is the number of cases now given, and meagre as are the details respecting most of them, enough probably has been advanced to shew that the subject under consideration is one not of speculative interest merely, but of real practical importance.

In order, however, to the due appreciation of the phenomenon, and in order also to give to our knowledge of it a truly practical value, it is absolutely necessary to know the *cause* of it. Fully to determine this may be impossible : but it seems quite within our reach to ascertain what is *not* its cause ; and this in a practical point of view is all that it concerns the Agriculturist to know.

* A young woman, born of white (Scottish) parents, but whose mother sometime before her marriage had a natural (mulatto) child to a Negro man-servant, exhibits distinct traces of the Negro. Dr. Simpson having had no recent opportunities of seeing her, cannot speak as to the precise extent to which the Negro character prevails in this young female's features ; but he recollects being struck with the resemblance, and remarked particularly that the hair had the qualities characteristic of the Negro.

Now, an ingenious explanation of the phenomenon has recently been offered by Mr. M'Gillavray, of Huntly. "When a pure animal of any breed (says Mr. M'Gillavray,) has been pregnant to an animal of a different breed, such pregnant animal is a cross ever after; *the purity of her blood being lost*, in consequence of her connection with the foreign animal;" and again: "If a cow, say of the pure Aberdeenshire breed, is in calf to a bull of the short-horn breed (known as the Teeswater breed), in proportion as this calf partakes of the nature and physical characters of the bull, just in proportion will the *blood* of the cow become *contaminated*, and herself a cross, for ever incapable of producing a pure calf of any breed." "It is maintained, therefore, (Mr. M'Gillavray adds), that the great variety of nondescript animals to be met with are the result of the crossing system; the prevailing evil of which is, the admission of bulls of various breeds to the same cow, *whereby the blood is completely vitiated.*"*

This theory of course applies only to that class of animals (the *mammalia*) where the female is provided with a womb, and has her offspring lodged there for a time. And in order to the better understanding of the theory, attention is requested to the following considerations: By the formation of the after-birth (*placenta*), a connection is established between the mother and the living creature (*fœtus*) in her womb, through which the latter is continually drawing supplies from the mother's blood, for its growth and maintenance. But there are good grounds for believing that, through the same channel, the mother is as constantly (though, doubtless, in much less quantity) abstracting materials from the blood of the fœtus.† Now, is it all unrea-

* "Aberdeen Journal" Newspaper, for March 21, 1849.

† As the whole theory hinges on this assumption, the reader who may wish to know the grounds on which it rests, is referred to a paper by the author, in the Monthly Journal of Medical Science, for October, 1850. It may be here stated, in addition to what is there urged in support of it, that Dr Kirkes, in a recent letter to the author, expresses his concurrence in the assumption.

sonable to suppose, that the materials in question may be charged with (or have *inherent* in them) the *constitutional qualities* of the fœtus, and that, passing into the body of the mother, and mixing there with the general mass of her blood, they may *impart* those qualities to *her* system? This supposition will, perhaps, appear the less improbable, if regard be had to the length of time during which the connection between the mother and fœtus is kept up, and during which this transference of materials must go on—a period of some weeks, or even of several months. But the qualities referred to must *in part* be derived by the fœtus from its *male* parent, and be to that extent *identical* with his. The *distinctive peculiarities*, therefore, of this parent may thus come to be *engrafted* on the mother, or to attach in some way to her system; and if so, what more likely than that they should be *communicated* by her to any offspring she may afterwards have by *other* males?

The influence thus supposed to be exerted by the male parent, through or by means of the fœtus, on the constitution and on the breeding powers of the female, may appropriately be designated *inoculation-influence*. To go more largely, however, into this part of the subject, were beside our present purpose, and would involve details, perhaps fully intelligible only to the professed physiologist. But it is due to Mr. M'Gillavray to state, that his theory not only furnishes a satisfactory explanation of the phenomenon, but is consistent with acknowledged facts in physiology, and is borne out to a greater extent than he was perhaps aware, by the known history of blood-diseases.

In a practical point of view, however, it is quite immaterial whether this theory gives the *true* explanation of the phenomenon or not. All that it is necessary to prove and be assured of is, that the phenomenon is *exclusively* referable to something corporeal (that is, *material* or *organic*) connected with the prior impregnation of the female. And were

this *indubitably* certain, all that need be sought after in a practical inquiry into the subject is, to observe accurately the appearances presented by the animals produced in the subsequent connections of the female with other males—to note the degree of resemblance which obtains to the first or to a former male—to ascertain, out of any given number of cases, in what proportion this effect is observed—and, generally, when it is observed, to determine the circumstances under which it holds, as also those under which it varies in different classes of animals, or in different individuals of the same class.

But it so happens that a phenomenon precisely similar to the one before us—so like it, at least, as not to be distinguishable from it—is sometimes seen under very different circumstances. An animal (for example) is sometimes observed to present the *same sort* of resemblance to another animal, with which its mother has never at any time had sexual connection,—a circumstance ascribed, and (in many such cases) on good grounds, to some state of the mother's mind, having a relation to that other animal, at or some time before the period of conception, or during her pregnancy. It is conceivable, therefore, that in many cases,—nay, in every case, where an animal resembles another (not its progenitor) by which its mother had formerly borne offspring,—that is to say, in the whole set of cases which form the subject of these pages,—the resemblance may be explained quite as well on the principle of *mental* influence, as on that of *inoculation*; or, at least, that in ascribing it, with Mr. Mc'Gillavray, to the latter cause,—or to any purely *corporeal* cause arising out of the prior sexual intercourse, *a manifest source of fallacy attaches to the assumption*. The phenomenon may really be resolvable, in any, and in every instance, into an affair of the mother's mind.

The *possibility*, therefore, that *mental* influence may furnish the *true* explanation of the phenomenon, at once raises a question which bears so directly on the present

subject, as to demand consideration in connection with it. To consider it fully, however, at this stage, would keep the *test* to be proposed for its solution too long out of view. I shall, therefore, here content myself with one example in illustration of this kind of influence, throwing into an appendix (No. I., p. 24) additional evidence of its reality.

A mare and a horse (a gelding) had, for some years, worked together on the same farm, occupied adjacent stalls in the same stable, and pastured together in summer in the same fields. The gelding was of a *black* colour with *white* legs and face, and had a *singular peculiarity* in the form of the hind legs, which, when the animal was standing, appeared as if quite straight, there being no appearance of the leg being bent at the hough-joint, as in ordinary cases; the pasterns, likewise, were very long, so as to cause the feet to look as if placed almost at right angles to the legs. After having been some years thus associated with this gelding, the mare was covered by a stallion of the same colour as herself,—both stallion and mare being of a *bay* colour, with *black* legs and a *small spot* of white only on the forehead. The foal which was the produce of this connection very exactly resembled the gelding in *colour* and in *shape*, and *very remarkably in the shape of the hind legs*, as above described.*

The striking feature of this case, besides the circumstance that there could have been no sexual connection between the mare and the gelding, is, that the resemblance of the foal to the gelding was at once general, and yet extended to a marked peculiarity of conformation; thus identifying the resemblance with something having a relation to that particular horse. This relation could be no other than a *mental* one, on the part of the mother, arising out of her

* Communicated to the Author by Dr. John R. Trail, of Monymusk, Aberdeenshire. "From the description I have attempted to give you (Dr. Trail writes me), you could not form any very distinct idea of the peculiar conformation of the gelding; but the resemblance of the foal to him was remarkably clear."

association with the horse. But had this horse been a stallion, and had he previously had fruitful intercourse with the mare, the resemblance might very fairly have been attributed to something *material* connected therewith.

It is clearly important, then, in regard to the proper subject of this Essay, to guard against a fallacy of this kind.

In order to this, and to determine conclusively whether the effect of cross-breeding on the subsequent progeny of the mother is, or is not, dependent on *mental* influence, all that seems necessary is, to institute experiments in breeding on a sufficiently large number of different kinds of animals, selecting animals of acknowledged purity of blood, and conducting the experiments so as to *exclude* the agency of any such *mental* impressions on the mind of the females as could reasonably be supposed to influence the results. Should the effect in question still appear, shewing itself in all or in a large proportion of the progeny, and be at the sametime sufficiently decided, it would clearly follow that it is *not* due to mental causes. It would be desirable, however, —although by no means necessary,—to institute another set of experiments, in which every advantage should be given to the agency of mental causes. Should the results from these be also of an *affirmative* kind, this would only prove that a like effect may also spring from mental causes. But the results could scarcely fail to furnish points of comparison and of contrast with those of the other set, and thereby enable us the better to estimate the value of the inference deducible from these; while, if they should be wholly, or in a great measure, *negative*, it is plain that they would add greatly to the conclusiveness of that inference.

Supposing, for the sake of example, that of twenty ewes ten are made the subject of the first set of experiments, and ten of the second set; and that, in the case of the former, there is observed, in all the second year's lambs, a decided

resemblance to the ram of the previous season (not their progenitor), and that the resemblance extends, not merely to the colour of this ram, but to his shape and other qualities also; and that in the case of the latter set, no peculiarity is observable in any of the lambs, or is seen only in a few of them, and that it reaches merely to a change of colour, not of shape,—we should have a tolerably sure footing to stand upon in drawing inferences from the experiments. And if a large number, and an endlessly diversified, but carefully conducted series of such experiments were made, and if they yielded like results, a calculation of chances would put it beyond all doubt, and establish as a principle in the physiology of the higher classes of animals, that, *quite independently of mental agency*, a male animal that has once had fruitful intercourse with a female, may influence the products of subsequent connections of that female with other males.

The following is a detailed outline of the most important of these

EXPERIMENTS:—

First Set.—To determine how far the *circumstance of a previous impregnation*, by a male of a *different* species, breed, or colour, from the female, influences the conformation or colour of the offspring afterwards borne by her to a male of the *same* breed and colour as her own,—the agency of mental causes on the result being excluded:—

The female to be served the first season by a male of a *different* species, breed, or colour from her own; and the following season by a male of the *same* breed and colour as herself, taking these precautions against the agency of mental causes,—*first*, and generally, that the female shall not at any time have seen the *former* of those males, nor

any animal of his species, breed, or colour; and *secondly*, and particularly, that the copulation of the female with the first male be so managed (*e. g.* by covering her eyes or head) as to prevent her from seeing him; and that, during both her first and second pregnancy, the female be kept, or made to herd, exclusively with animals of her own breed and colour;—and farther, that immediately on her first delivery, the (cross) animal produced be taken from her, and ever after kept out of her sight.*

Second Set.—To determine how far *mental* causes, operating through the external senses on the mind of the female, influence the colour and conformation of her offspring:—

The female to be coupled with a male of the *same* breed and colour as herself—the following expedients being resorted to, in order to favour the agency of the mental cause,—*first*, that at the time of being so coupled, the female be prevented from seeing that male animal, but have fully in her view animals of a *different* species, breed, or colour; and, *secondly*, that, so soon as the season of heat is begun (or even earlier), and during the whole period of her pregnancy, she be made to associate or herd exclusively with animals of that description—regard being had in respect of these, that, in each experiment, one sort be kept to, lest the mind of the female should be *distracted* by a *variety* of impressions.

The details now given embrace the *principles* on which,

* The reasons for several of these precautions will appear from some of the cases given in the Appendix (No. I.)

as it seems to me, *decisive* experiments might be made, and also the *precautions* necessary to be attended to, in order, as far as possible, to avoid fallacy in the results obtained from them. They might be very variously modified, and ought certainly to be tried on many different kinds of animals, in order to give at once a breadth and precision to the results. Such experiments, I am told by persons conversant in these matters, could easily be made; and I would venture to suggest that they might be tried, in the first instance, on animals of the *sheep*, *pig*, and *dog* kinds. None of these (speaking generally) is of such pecuniary value, as, on the score of expense, to deter persons from experimenting. The number of progeny, also, following each conception is, with the dog and pig, considerable,—thus extending the field of observation; while any supposed defect of mental power in either the sheep or the pig, would be compensated for by the acknowledged superiority of the dog in this respect.

What might be the issue of such experiments, if instituted, it were, perhaps, wise at present not to hazard an opinion. Trusting that the subject will yet receive from others that thorough investigation which its practical importance seems to call for, I would here beg to introduce, as a contribution to the stock of experiments, a fact which seems to me to tell very decidedly in favour of Mr M'Gillavray's theory. Premising that, if mental influence be inoperative in the result, it might be anticipated from the acknowledged restriction of the inoculation-influence to animals of the class *mammalia* (see page 10), that in the case of *birds*, the peculiar effect of crossing here in question should fail to be observed—the eggs, so soon as they are fertilised, or shortly after, being *extruded* from the body of the female, and the young birds (developed *outside* their mother) *never brought into contact or relation with her blood*, and incapable, therefore, of contaminating or inoculating it. And,

accordingly, the result tallies with this anticipation. In the case of the common barn-door fowl (for example), if, after crossing one season between the hen and the bantam cock, and thus obtaining birds which take very strongly after the cock, the hen is treaded exclusively the next season by a cock of her own breed, it is (I am given to understand) uniformly found that no trace whatever of the bantam is discernible in the birds of this brood.*

On a subject so obscure as the nature of the phenomenon here treated of, light from any quarter is valuable. I would, therefore, take occasion to add to the foregoing, one other observation (as to an effect of crossing),—first made by the Count de Strzelecki, and still resting chiefly on the testimony of that most intelligent and trust-worthy traveller,—but which, if a fact, appears to me to be explicable only on the principle of Mr. M'Gillavray's theory, and thus in its turn to give support to this theory. It is this,—that among the aborigines of certain countries, the effect of fruitful intercourse between a native female and an European male is to incapacitate the female from ever afterwards conceiving by a male of her own race, without, however, impairing her fertility with the European.† Referring the reader to the appendix (No. II., page 34) for details as to this very singular statement, and for some reflections naturally arising out of it, I would only at present observe that, assuming it to be a fact, the *relative* sterility thus induced may, with great probability, be ascribed to some change wrought in the *constitution* of the female during her pregnancy, by the child begotten by the European—in other words, that the *cause* of the sterility may be analogous to, if not in its nature identical with that supposed by Mr. M'Gillavray to be concerned

* For the suggestion of this fact, I am indebted to the kindness of Professor Paget, of St. Bartholomew's Hospital, London.

† Strzelecki's "Physical Description of New South Wales and Van Dieman's Land," p. 347.

in *modifying*, without seemingly *impairing*, the breeding powers of the female among the lower animals.*

Should it be clearly established by such experiments as have now been suggested, that an animal, the produce of a male and female of the same breed, born subsequently to the impregnation of the female at a former period by a male of a different breed or species from her own, has, *from the single circumstance of such previous impregnation*, its growth and constitution so far modified as to resemble that male animal not its progenitor, there would still remain another and an important object of enquiry, viz.:—to determine the *law* of the phenomenon or the *conditions* essential to its occurrence; that is to say, to ascertain the extent to which the fact holds, and the circumstances under which it holds (see page 12), with the view of enabling the agriculturist to make the requisite application of the fact in the breeding of stock.

The experiments themselves, instituted with the view of *testing* the principle and resulting in its establishment, would go far towards the accomplishment of this other and practically more important object. But the following questions deserve attention in the prosecution of this branch of the inquiry:—

1. Does the fact hold *universally*, or only *pretty often*, or only *occasionally* and *rarely*?
2. Does the animal so produced partake *decidedly* or

* I say *seemingly impairing*, because I would venture to suggest to the agriculturist that it might be worth his while to inquire whether something corresponding to this may not be a collateral result of cross-breeding in the lower animals, adding,—in connection with that suggestion, that it has been stated to me, though not on sufficient authority, in regard to the *mare*, that, though not rendered sterile to the horse, she does not readily conceive by him after breeding with the *ass*, with which she continues very fertile.

only *partially* of the characters of the male animal which it resembles,—in *colour* merely, or in *conformation* also?

3. Does the degree of resemblance depend on the number of times the mother may have conceived by that male, before bearing the animal in question?

4. Is the resemblance lessened or in anywise affected by the female having been *first* impregnated by a male of her own breed and colour, prior to her having borne offspring by that other male?

5. Does the resemblance to that male become less and less in each animal successively produced, and does it ultimately become imperceptible?

In conclusion, it may be remarked that, in any investigation into the subject of this essay, there are two distinct branches of inquiry,—

The *first* is to ascertain the *cause* of the phenomenon,—to *test* Mr. M'Gillavray's principle of inoculation, as far as this can be done; and, particularly, to determine whether the phenomenon is, or is not, independent of *mental* influence. And,

The *second* is, supposing it to be proved that the phenomenon is referable to something *material* connected with the previous impregnation of the female, to ascertain the *law* or the *conditions* under which it occurs—in short, the special details of the fact.

A P P E N D I X.

A P P E N D I X .

I.—ON MENTAL STATES IN EITHER PARENT AS INFLUENCING THE GROWTH AND CONSTITUTION OF THE OFFSPRING.

That mental causes, or states of mind, operating within the female during pregnancy, or within either parent at the time of sexual connection, may variously influence the growth and constitution of the *fœtus*, has long been matter of popular belief; and, setting a goodly number of recorded instances to the account of old wives' fables, this belief may be allowed to have a stable foundation in facts. It is not my intention, however, to enter on the general question as to this effect of mental influence, farther than as it bears on the proper subject of this Essay: all that I purpose doing is simply to bring together such facts as may serve to shew that mental causes may so influence the growth of the *fœtus* as to produce results analogous to those ascribed to inoculation by a *former* *fœtus*, and thereby to exhibit a source of fallacy in the reference of these to such inoculation as their cause.

(1.) Of the cases of this kind now to be submitted, some involve changes both in the configuration and the colour of the progeny,—others, so far as appears, changes (only or chiefly) in the colour.

In Daniel's "Rural Sports" the following details are given respecting a setter-bitch and cur-dog:—

"As the late Dr. Hugh Smith was travelling from Midhurst into Hampshire, the dogs, as usual in country places, ran out barking as he was passing through the village, and amongst them he observed a little ugly cur, that was particularly eager to ingratiate himself with a setter-bitch that accompanied him. Whilst stopping to water his horse, the doctor remarked how amorous the cur was, and how courteous the setter seemed to her admirer. Provoked to see a creature of *Dido's* high blood so obsequious to such mean addresses, the doctor drew one of his pistols, and shot the cur. He then had the bitch carried on horseback for several miles. From that day the setter lost her appetite, ate little or nothing, had no inclination to go abroad with her master, or to attend his call; but seemed to pine like a creature in love, and express sensible concern at the loss of her gallant. Partridge season came, but Dido had no nose. Some-time after, she was coupled with a setter of great excellence, which, with no small difficulty, had been procured to have a breed from, and all the caution that even the doctor himself could take was strongly exerted, that the whelps might be pure and unmixed. Yet not a puppy did Dido bring forth but was the *exact picture and colour* of the cur that had so many months before been destroyed. The doctor fumed, and, had he not personally paid such attention to preserve the intercourse uncontaminated, would have suspected that some negligence had occasioned his disappointment; but his views were in many subsequent litters also defeated, for Dido never produced a whelp which was not exactly similar to the unfortunate cur, who was her first and murdered lover."*

In Mr. Blaine's "Encyclopædia of Rural Sports" this other case is given:—

"The late Lord Rivers [says Mr. Blaine] was famed for a breed of black-and-white *spaniels*, one of which, having more than the usual quantity of white, he presented to us. We had, at the same time, a *pug-bitch* of great beauty. The attachment of this bitch to the spaniel was singularly strong. When it became necessary to separate her, on account of her heat, from this dog, and to confine her with one of her own kind, she pined

* Daniel's Rural Sports, vol. iii., pp. 333, 334.—A case very similar to the above, occurring in a bitch belonging to himself, has been mentioned to me by Mr. Walker, Portlethen, in Kincardineshire.

excessively ; and, notwithstanding her situation, it was some time before she would admit the attentions of the pug-dog placed with her. At length, however, she was warded by him, impregnation followed, and at the usual period she brought forth five pug-puppies, *one of which was perfectly white, and rather more slender* than the others, though a genuine pug. The spaniel was soon afterwards given away. At two subsequent litters (which were all she afterwards had) this bitch also brought forth a *white* pug-pup, which the fanciers know to be a very rare occurrence. It is also a curious fact, that each succeeding white puppy was *less slender* in form than the preceding, though all were equally white.”*

The two cases now given have many points in common, and appear to be free from any material source of fallacy. In the former there was not even sexual intercourse—much less fruitful intercourse—between the bitch and the cur, to whom her progeny bore so decided a resemblance ; and in the latter, if intercourse occurred, which it appears did not, there was no result from it. In both females there seems to have been a strong and an abiding attachment to the cur and spaniel respectively, and an equally keen and enduring emotion of disappointment at being separated from them. The resemblance of the progeny, or of certain of these, to the dogs, appears, moreover, to have been of too special a kind to admit the supposition of its being accidental. There need be no question, therefore, but that the cases are fair examples of mental impressions of a permanent character so operating on the female parents as to influence the development of their offspring while in the womb, and that in such a manner as to cause them to resemble the male animals that were the occasion of those impressions.

Dr. Montgomery of Dublin, gives the following interesting case, which, though occurring in the human subject, is, perhaps, not the less valuable :—

“ A lady, pregnant for the first time, to whom I recommended

* Encyclopædia of Rural Sports, by Delabere P. Blaine, Esq., p. 412.

frequent exercise in the open air, declined going out as often as was thought necessary, assigning as her reason, that she was afraid of a man, whose appearance had greatly shocked and disgusted her: he used to crawl along the flag-way, on his hands and knees, with his feet turned up behind him, which latter were malformed and imperfect, appearing as if they had been cut off at the instep,—and he exhibited them thus, and uncovered, in order to excite commiseration. I afterwards attended this lady in her lying-in; and her child, which was born a month before its time, and lived but a few minutes, although in every other respect perfect, *had the feet malformed and defective, precisely in the same way as those of the cripple* who had alarmed her, and whom I had often seen.” *

Nothing can be more appropriate than Dr. Montgomery’s short commentary on this case:—“Here was an obvious and recognised object making a powerful impression, of a disagreeable kind, complained of at the time, and followed by an effect in perfect accordance with the previous cause,—there being between the two a similarity so perfect, that, with Morgagni, I ‘will not easily suppose that chance could have been so ingenious, if I may be allowed to speak thus, and so exact an imitator.’ ”

A case very similar to the foregoing has been communicated to me by a distinguished English physiologist,—himself personally cognisant of the facts. It is as follows:—

“A lady, when two or three months pregnant, was accosted by a *one-armed* beggar, who, on her refusing to relieve him, menaced her violently, so as to alarm her seriously, and shook his stump at her. She was extremely agitated, and during the whole remainder of her pregnancy was under the firm expectation that her child would be one-armed,—which was the case.” This child is now grown up to manhood, and occupies a highly respectable position in society.

In this case (and the remark applies equally to Dr. Montgomery’s) the effect was *partial* only, and on this account it may be thought not altogether pertinent to the subject under

* Exposition of the Signs and Symptoms of Pregnancy, &c.. pp. 16, 17.

consideration ; but it probably embraced all that was peculiar in the object, as it certainly did all that was striking to the mind of the lady. And had the occasion of the impression been some well-marked but natural peculiarity of the features—of the nose, for example,—instead of a deformity of the arm ; and had the man been the object formerly of the lady's love and attachment, and still during her pregnancy of her cherished regard,—and had the resemblance in her child extended to the part supposed,—the effect, though equally partial, might have seemed more general. The case might thus have been set down as a fair example of the power of the imagination, in a pregnant female, to cause her offspring very exactly to resemble an individual not its father. Of this the following is perhaps an instance :—

A young married woman, residing in Aberdeen, between whom and a young man a strong attachment and a matrimonial engagement had long existed, but who were never married, and never had sexual intercourse together, gave birth to a child, which bore so striking a resemblance in its features to the woman's first lover, as to attract the notice of herself and many others of the acquaintance of the parties.

In this case—communicated to me by Mr. Robert M. Erskine, surgeon, here, who was well acquainted with the individuals concerned, and had personally satisfied himself of the accuracy of the facts—the resemblance may have existed only in the imagination of the observers, or been magnified through the love of the marvellous,—but, giving it as given to myself, I adduce it merely as an example of what may be a real occurrence, and what, if real, would remarkably resemble in its result the observation alluded to in the body of this pamphlet (pp. 8-9) viz., that the human female, when twice married, bears occasionally to the second husband children resembling the first, both in bodily structure and mental powers.

It appears that many breeders of stock are impressed with the belief, that certain *colours* present to the eye of the parent animals, and particularly of the female, at the time and in the act of their being coupled together,—and to the eye of the female both before and during her pregnancy, influence the *colour* of the progeny; and that they make this belief a practical principle of action in the breeding of their stock, in order either to prevent or to secure the admixture of any particular colour in the offspring different from that of the parent animals. “We know,” says an anonymous writer, “a great breeder of pure Angus stock [black polled breed], who makes it a rule to have every animal about his farm of a black colour, down to the very poultry.”* And an eminent breeder of the same kind of stock in this county informs me, that he extends this rule to the *steadings* in which his cattle are kept.

To illustrate generally the grounds of this belief and practice, the following cases may be cited:—

(a) A black polled Angus cow, belonging to Mr. Mustard, a farmer in Forfarshire, came into season while pasturing in a field bounded by that of a neighbouring farmer. Out of this field there jumped into the other field an *ox*, of a *white colour*, with black spots, and *horned*, which went with the cow till she was brought to the bull,—an animal of the same colour and breed as herself. Mr. Mustard had not a horned animal in his possession, nor any with the least white on it; and yet the produce of this (black and polled) cow and bull was a black-and-white calf, with *horns*.†

(b) In 1849, twenty cows of the black polled Angus breed,—belonging to Mr. William M'Combie, in this county, and whose stock is perhaps the finest in the kingdom,—produced as many calves, all of them black and polled, except one single calf, which was *yellow-and-white spotted*. Mr. M'Combie had, as usual with him, taken the precaution of causing the cows, both before and during their pregnancy, to mix with none save perfectly black cattle, except in respect of the mother of this calf, which cow had unwittingly been put to an out-farm, to be starv-

* “North of Scotland Gazette” newspaper, for July 17, 1849.

† Library of Society of Useful Knowledge, volume on Cattle, p. 171.

ed, in order to fit her for the bull. There, for a considerable period prior to her being served with the bull, she had grazed with a large *yellow-and-white spotted ox*, of which ox the calf she subsequently bore was the very picture,—the likeness, however, extending no farther than to the colour, and the calf still retaining the shape and configuration of its parents, which were both of the same breed and colour.*

(c) Out of a large herd of cows, of the pure Teeswater breed, all of them of the brown or roan colour (belonging to Mr. Cruickshank, Sittyton, near Aberdeen,) there is every year dropt one, or at most two, *white* calves, which, in order to prevent the introduction of this colour among the cattle, are invariably sold, and sent away. In 1849, however, concurrently with the *white-washing* of all the farm-steadings, the very large number of twelve white calves were produced. And the like occurrence happened the same year also, in the herd of an extensive breeder of the same kind of stock, in Yorkshire, in connection with the like process of white-washing,—this process having, in both cases, been very extensively carried out before the breeding season began, with the view of preventing the breaking out of the pleuro-pneumonia, then epidemic in the neighbourhood, and very destructive.†

(d) “At the time when a stallion was about to cover a mare, the stallion’s pale colour was objected to, whereupon the groom, knowing the effect of colour upon horses’ imaginations, presented before the stallion a mare, of a pleasing colour, which had the desired effect of determining a dark colour in the offspring. This is said to have been repeated with success in the same horse more than once.” ‡

(e) “I was told (Mr. M’Combie writes me) by an old servant of mine, Morrice Smith, that, when he was a servant in the parish of Glass (Aberdeenshire), a black bull served a black cow at the time when a white mare passed them, and that the produce was twin *white* calves. There were no white cattle upon the farm where this occurrence happened.” §

* Communicated to the Author by Mr. M’Combie.

† Communicated by Mr. Cruickshank, who says further, that he has had too many proofs of the agency of the cause in question to allow him entertaining any doubt on the subject.

‡ Cyc. Anat. and Phys., vol. ii., p. 474.

§ My friend, Dr. J. M. Duncan, of Edinburgh, writes me that he has “more than once heard farm-servants say, that it is a sure plan to get a white foal, to hang up a pure white sheet before the mare when she conceives.” Probably hanging up such a sheet in the stable during the

Such cases as several of those now cited can scarcely fail to recal to the reader's mind the story, given in the book of Genesis (chap, xxx.), of Jacob and his peeled rods, and the effect of these in causing the flocks, before whom they were placed at the time of conception, to bring forth ring-straked, speckled, and spotted cattle.

It does not appear from the sacred narrative whether the influence of the rods was exerted on the minds both of the male and female cattle, or confined to those of the female. But it seems probable (Gen. xxxi. 5-12) that the effect was a *supernatural* one, and designed to enrich the needy patriarch at the expense of the crafty Laban, by whom, for fourteen years, he had been sore let and hindered "in providing for his own house;" and that Jacob had beforehand, in a dream, intimation given him of the design, as well as a sensible representation both of the agency to be employed and of the result which was to follow. If this were the character of the transaction, it would be unwarrantable to draw any inference from it, in relation to the present inquiry, unless it could be shewn, which I apprehend it cannot, that the same expedient will now, as then, produce the like results. At the same time it may, perhaps, be not unfairly referred to, in illustration of ordinary phenomena of a somewhat analogous kind. Read by the light of these, it may be held to indicate that the Almighty accomplished His purpose simply by *enhancing* a natural agency—"moulding it secretly in the hollow of His hand,"—and so be regarded as reflecting back light in its turn upon that agency. The validity, however, of this appeal must turn upon our being able to satisfy ourselves, on independent grounds, that there

whole period of pregnancy would be equally effectual. And another correspondent (J. Warwick, Esq., Sussex House, Hammersmith) says:—"The belief in the effect of external objects on the imagination of pregnant women is so strong in Italy, that females in that condition keep in their rooms, and before their eyes, small wax figures of a *pretty child*. This is called 'Il Bambino,' represents the infant *Jesus*, and is especially worshipped and adored, with the view of procuring beautiful offspring."

is in nature an agency of this kind, and its precise value upon the extent to which we can thus ascertain that it ordinarily operates,—questions these for the solution of which we have not at present the requisite data.

(2.) All that need be said in the way of direct inference from the facts here brought together, may be comprised within a narrow compass.

Supposing the statements respecting them to be authentic—and no question, I apprehend, as to this can well be raised—the cases are nearly unequivocal. The only fallacy that can attach to them, is that arising from the possibility, that the peculiarities in the progeny were either purely *accidental*, or owing to corresponding qualities *latent* in the parents, but breaking out in the offspring. The relation, however, in most of the cases, between the peculiarities in question and their presumed causes, is too close and of too special a character to admit of either supposition. We are, therefore, well entitled, I think, to regard the greater number, if not the whole of them, as examples of mental causes so operating either on the mind of the female and so acting on her reproductive powers, or on the mind of the male parent and so influencing the qualities of his semen, as to modify the nutrition and development of the offspring.

How, in respect of the female, this influence is exerted, and what the conditions of its action, it is not easy to determine. The mental affections seem to have been in most of the cases, and were probably in all of them, of a *strong* and *enduring* kind; and we can easily conceive this to have been essential to the result. That the alteration in the growth of the foetus was determined solely, as is vulgarly supposed, by the *images* in the mind of the mother, *i.e.*, by the mere *sensations* and *perceptions* therein produced, independently of the *emotions* excited by them,—cannot well be supposed. It is, doubtless, to this “*compound state*” of mind—to use an expression of Sir James Mackintosh—

a state "easily called to mind," in consequence of the vividness of its first impression, "frequently recurring," and "warmly felt," * that we must ascribe the effect.

It is not unlikely that this particular agency of the mind is more frequently exerted in the females of the lower animals than in those of our own species; and that cases exemplifying it are oftener met with in the brutes than in man. If this be so, a reasonable explanation of the fact may be given. We know that the minds of the lower animals are in a great measure limited to *particulars*, and these few in number, and almost exclusively external objects of sense; that the external senses are more perfect in them than in us; and that the perceptions resulting from their exercise seem, in various instances, to follow more surely and more quickly—to be more intuitive and wider in their scope, and more vivid—in them than in man; and that the simpler emotions (excited by those perceptions) of joy, fear, affection, anger, &c., of which they are manifestly susceptible, seem often to be peculiarly strong.† We know also that they possess the faculty of *memory*; and we may well suppose, from their limited range of association (or suggestion), that sensations that formerly made a powerful impression on their minds, will be more easily and oftener recalled in them than in us, who, though more apt to be "troubled about many things," are proportionally less apt to be affected, or at least permanently or continuously impressed, by any one thing. These circumstances and peculiarities of mental action must obviously be singularly favourable to the production of the results in question.

It may be remarked in conclusion, that the word *imagination*, generally used to designate the mental states here concerned, is, perhaps, an unfortunate one; and it may be questioned whether much of the scepticism prevalent among

* Ethical Philosophy, edited by Whewell, 2d edit., pp. 397, 398.

† See art. "Instinct," in Cyc. of Anat. and Phys.

physiologists as to the effects, or alleged effects, on the development of the foetus, of certain complex mental affections, be not in great part owing to the use of that term. Certain mental *conceptions* or ideas, suggested to the mind independently of any present or actual external object, and exciting strong and enduring *emotions*, constitute that state of mind to denote which *imagination* is used here. Often, however, it is used to denote the power by which the mind forms to itself pictures which have in such a combination no prototypes in nature—the power of *creative* or *poetical* imagination, which, manifestly, is not possessed by the brutes. The state referred to here, that of *simple* imagination, is one compounded only of simple conception and emotion.

The part which each of these plays in the production of the physical result on the foetus, is not at all obvious. No doubt, the *direction* (so to speak) in which the influence of the emotion is exerted, is dependent on the perception, or the idea (conception) which excites it—otherwise no correspondence would be observed between the effect on the foetus and the external cause of the perception, or the idea, — and the effect, when produced, would be indeterminate in its character, *e.g.*, the sight of a bright yellow colour might give rise to a purple one in the foetus, or the idea of the child to be born having a tail to its being a cylops. Still, in order to the production of the effect, it seems almost, if not quite essential, that the perception or the idea should be *backed*, if the expression may be allowed, by an emotion of a strong and an abiding kind. And if so, the effect altogether must be ascribed to that *complex* or *compound* state of mind, which is all that is here meant by *imagination*.*

* The subject of mental influence has been here considered without reference to any inquiry into the specialities of its operation. But were such an inquiry to be entered on, it would be proper to make such experiments as should exhibit how far the influence in question may ope-

II.—ON THE EFFECT OF FRUITFUL INTERCOURSE BETWEEN
THE ABORIGINAL FEMALE OF CERTAIN COUNTRIES, AND
THE EUROPEAN MALE, IN IMPAIRING THE FERTILITY
OF THE FEMALE.

The Count de Strzelecki's own statement as to this is,—
“Whenever such intercourse takes place, the native female is found to lose the power of conception on a renewal of intercourse with the male of her own race, retaining only that of procreating with the white men.”*

Extraordinary as this statement is, it is not lightly made; nor have the opportunities enjoyed by the Count de Strzelecki of making observations regarding it been small. He has “lived much (to use his own words) amongst different races of aborigines,—the natives of Canada, of the United States, of California, Mexico, the South American Republics, the Marquesas, Sandwich, and Society Islands, and those of New Zealand and Australia.”† And, referring to the statement already quoted, the Count observes—“*Hundreds of instances of this extraordinary fact are on record in the writer's memoranda, all recurring invariably under the same circumstances, amongst the Hurons, Seminoles, Red Indians, Yakies (Sinaloa), Mendosa Indians, Araucos, South Sea Islanders, and natives of New Zealand, New South Wales, and Van Dieman's Land; and all tending to prove that the sterility of the female, which is relative only to one and not to another male, is not accidental, but follows laws as eo-*

rate—*first*, at any time prior to the period of sexual connection,—*secondly*, at the time of such connection,—and *thirdly*, during pregnancy. The modes of devising and conducting experiments of this kind will readily suggest themselves to any one conversant in these matters.

* “Physical Description of New South Wales and Van Dieman's Land,” p. 347. † Ibid. p. 345.

gent, though as mysterious, as the rest of those connected with generation." *

In the work in which the foregoing allegations are made, Strzelecki does not state whether he has ever met with *exceptional* cases,—that is to say, cases where, after connection of the kind in question, fruitful intercourse has taken place between a native man and woman. But in a communication on the subject with which he has favoured me, the Count assures me, that he has never met with such a case. "It has not (he writes me) come under my cognizance to see or hear of a native female, which, having a child with a European, had afterwards any offspring with a male of her own race." And I am informed by Professor Goodsir, and by Dr. Carmichael of Edinburgh, and by Dr. Maunsell, of Dublin, that they have learned from independent sources, that, as regards the aborigines of Australia, Strzelecki's statement is unquestionable, and must be regarded as the expression of a law of nature.†

Assuming that the fact is truly a law of nature, and that it holds as absolutely and extensively as Strzelecki's experience would lead us to infer, "it is," as Professor Goodsir observes, "a very remarkable one, and indicates a series of influences of high import in the natural history of the human race." What that import is, it may not be easy to comprehend, nor perhaps is it a short line that will fathom it. But it seems to indicate, how little account soever might be taken of it by the author of "The Vestiges of the Natural History of Creation," that there is in

* "Physical Description of New South Wales and Van Dieman's Land," p. 347.

† "The intercourse of Kamchamha's men [people] and that of the whale ships [manned by Europeans], which now began to anchor in their waters, was sadly disastrous to the native constitution and morals, poisoning the fountains of health, and inducing premature decay and *barrenness*." This observation though by no means very definite, seems to point to the fact alluded to in the text. See an article entitled "On the Sandwich or Hawaiian Islands," in the "New York Biblical Repository and Critical Review," for July, 1849.

nature a principle of *degradation*, as well as a principle of *development*. The fact itself, it may be observed, is brought forward by Strzelecki as affording an explanation, and as being the chief cause of the gradual diminution and ultimate extinction of the native tribes in most parts of the new world, which follow the introduction of the European races. "Wherever the white man has set his foot-mark, there the print of the native foot is obliterated; and as the tender plant withers beneath his tread, so withers the aboriginal inhabitant of the soil." * And "human interference," says Strzelecki, "to avert this melancholy consequence has been hitherto of no avail;—a charter for colonization granted to one race becomes virtually the decree for the extinction of the other." †

Very various causes, doubtless, concur to bring about this result. The one assigned by Strzelecki as the chief is obviously quite adequate, if a real one, to its production. And should his belief as to the reality of this cause be confirmed, and should it farther appear, that the principle involved in it applies only to aboriginal females contaminated by European males, and not to European females contaminated by aboriginal males, that is to say, should the former class of females only, and not the latter, be rendered sterile to males of their own race by such foreign intercourse, the discovery can scarcely fail, not merely to exhibit the predominancy of the white over the dark races of men, in a particular not previously sus-

* Brooke's Narrative of Events in Borneo and Celebes, vol. i. p. 12.

† Strzelecki records the following remarkable circumstance which came within his own personal knowledge:—A party of aborigines in Van Dieman's Land, to the number of 210, were deported by government in 1835 to Flinder's Island, on account of aggressions made by them on the colonists in their neighbourhood, by whom, however, they had been contaminated. They had only 14 children born among them during the next seven years. It is true, that, in the course of that time their own numbers had dwindled away to 54. Still, the small number of births is singular, and contrasts strikingly with the fact, that "each family, in the interior of New South Wales, uncontaminated by contact with the whites, swarms with children."—(Op. cit. pp. 350-5.)

pected, but to indicate that the designs of Providence, in regard to the human family in this stage of existence, embrace the ultimate extinction of the primitive varieties of the dark races, or at least of certain of these. Their physical peculiarities and their social degradation—a mystery, if not a standing memorial of a curse visited on their progenitors, in the times of miraculous interposition; the purpose of their existence in respect of this earth—a mystery also, yet somehow subservient, seemingly, to that of their more favoured *brethren*;—their end, after that purpose is served—extirpation? But these are questions which, besides that they are foreign to the object of this paper, are, perhaps, too deep for human penetration.

It may not, however, be out of place to remark, that it may form part of the plan of Providence that certain races of men should hold given portions of the earth's surface till certain other races, and in particular our own Anglo-Saxon race, are ready to step in and occupy them,—those primitive races then disappearing; and that the law in question may be directly subservient to the extermination of these. The rapid increase of the Anglo-Saxon race during the last two centuries, its wide diffusion over the globe, and its superiority over every race with which it has come in contact, are in harmony with that supposition. It has recently been stated, with regard to this race, that while in 1620 it numbered only about six millions, and was almost exclusively confined to the United Kingdom, it now numbers sixty millions of human beings, planted upon all the islands and continents of the earth, and fast absorbing or displacing all the sluggish or barbarous tribes on the continents of America, Africa, Asia, and the islands of the sea; and that, increasing everywhere by an intense ratio of progression, it is estimated that, if no physical revolution supervene to check its propagation, it will number eight

hundred millions of human beings in less than 150 years from the present time.*

It seems tolerably certain that Strzelecki's law does not extend to the Negro race—the fertility of the Negro female with the male of her own race not being apparently impaired by previous fruitful intercourse with the European male,—a kind of intercourse which is notoriously common in all the West India Islands, the Brazils, and the slave-holding States of North America. But it is yet, I apprehend, undetermined, and it must surely be interesting to ascertain whether the law applies to the Mongolian and pure Malay races, inhabiting China, Japan, Borneo, and the islands of the Eastern Archipelago. And, if it should, one cannot help considering, in connection with it, the footing which Britain has of late acquired in those regions,—the probable rapid increase of our countrymen there and in Australia, Van Dieman's Land, and New Zealand,—and the Anglo-Saxon *nation* rising up as with mushroom growth in California, to overspread the western coast of America,—and asking whether, through the instrumentality of that law, the native inhabitants of those parts of the East may not yet be rooted out?

But our knowledge of this law must be far wider and more precise than it yet is, to enable us confidently to speculate in regard to it. We do not even know for certain that it holds absolutely over the races specified by Strzelecki, or that the Negro race is wholly exempt from it. It is conceivable, in regard to the former, as Strzelecki himself frankly allows to me, that there may be exceptions to it, though he has met with none; and, in regard to the latter, that it may be in some degree subject to it. It is well known, indeed, that in the West India islands, under the system of slavery at least, the black

* American Paper. Quoted from "Chambers' Edinburgh Journal," for July, 1850.

population tends rather to diminish than increase, and that it can only be adequately maintained by continual importations from Africa. Whether that diminution is in any degree owing to the operation of Strzelecki's law, it is perhaps at present impossible to say.

I would only remark farther, that in arguing here from Strzelecki's inference, it is only provisionally, and on the supposition of its being a fact; and if a fact, then, of course, a *law* of nature; and that in this, as in every other part of this Essay, my object is to suggest and direct inquiry, not to dogmatise. A correspondent, indeed, laughs at me for having elsewhere given heed to that inference. On the other hand, a writer in the "Edinburgh Review" (No. CLXXXIV., p. 456, foot note), referring to one of my papers in the Edinburgh Monthly Journal of Medical Science, suggests that Strzelecki should "*excuse*" me for treating it as nothing more than an hypothesis for the present! Considering, however, on the one hand, the astounding nature of the inference, and, on the other, the high character of Strzelecki as a philosophic observer, as well as the extent of his observations, (some *hundreds* of instances of the phenomenon without a single exception,) I humbly submit that, until the inference shall be either fully established or shown to be fallacious, the proper course in regard to it is, "to keep the mean between the two extremes of too much stiffness in refusing, and of too much easiness in admitting" it,—or (in the words of the wise and good Bishop Butler) to keep "in the middle state of mind," "between a full satisfaction of the truth of it, and a satisfaction of the contrary"—this middle state of mind consisting "in a serious apprehension that it may be true, joined with doubt whether it be so."—(*Analogy*, Part II., Conclusion.)

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